

Definition

Dyspnea is an uncomfortable abnormal awareness of breathing. A number of different sensations experienced by patients are probably included in this category. Dyspnea is the most common cause of respiratory limitation of activity in patients with pulmonary disease.

Dyspnea is a subjective symptom reported by patients. It is always a sensation expressed by the patient and should not be confused with rapid breathing (tachypnea), excessive breathing (hyperpnea), or hyperventilation. Dyspnea is most frequently described as shortness of breath, inability to take a deep breath, or chest tightness.

Technique

A good history is necessary to separate a truly dyspneic sensation from other dysphoric sensations experienced in the chest, such as chest tightness caused by myocardial ischemia. Exertional dyspnea must be separated from exertional fatigue and weakness.

Once a history of dyspnea is obtained, a detailed study is important in evaluating the differential diagnosis. The differential diagnosis of dyspnea includes a number of pulmonary and cardiac diseases, as well as neuromuscular diseases of the chest wall and anxiety. Information that should be obtained in every patient with dyspnea is outlined in Table 36.1. The history will generally allow pursuing a reasonable path toward making a diagnosis.

The quantification of dyspnea is also important in judging the severity and prognosis of the underlying disease. Dyspnea may be the limiting symptom and may be responsible for economic and social disabilities. Because dyspnea, like pain, is a subjective symptom, it is frequently influenced by the state of mind of the patient. In spite of this, in most patients a very good association exists between the severity of the underlying disease and the complaint expressed by the patient.

Although no physical findings directly relate to the complaint of dyspnea, several things may be seen in dyspneic patients. Dyspneic patients frequently breathe rapidly and shallowly. The accessory muscles of respiration may be used, and supraclavicular and intercostal retractions may be seen. Cardiac, pulmonary, and neuromuscular examinations should receive particular attention in patients with dyspnea.

A chest radiograph is frequently helpful in evaluating patients with dyspnea. Characteristic roentgenographic findings occur in patients with congestive heart failure, pneumonia, and pulmonary fibrosis. The chest radiograph may also be abnormal in patients with obstructive pulmonary disease, but the chest film is neither sensitive nor specific for the detection of airflow obstruction; major abnormalities on the chest film are seen only in patients with far advanced obstructive pulmonary disease.

The laboratory is of no use in the detection of dyspnea, but may be of great value in the differential diagnosis and in quantifying the severity of the underlying disorder. Pulmonary function tests are useful in the detection of obstructive and restrictive diseases of the lung and chest wall. The vital capacity and forced expiratory volume in 1 second (FEV₁) obtained from simple spirometry usually correlate well with the sensation of dyspnea in most patients with lung disease. More sophisticated and expensive tests are frequently unnecessary. Arterial blood gas studies are generally performed in dyspneic patients, but are of limited usefulness in evaluating dyspnea. There is not a good correlation between the severity of hypoxemia and the severity of dyspnea. Arterial blood gases are, therefore, most useful for quantifying the severity of gas exchange abnormalities in patients with established pulmonary dysfunction.

Depending on the findings obtained during the history and physical examination, laboratory testing of cardiac function and neuromuscular function may be useful in making a diagnosis. Occasionally patients require more sophisticated testing, including exercise testing with gas exchange measurements, measurements of pulmonary compliance, and measurements of respiratory muscle strength and respiratory neurologic drive. None of these measurements actually aids in the detection of dyspnea, but may be of some value in explaining or quantifying dyspnea in a patient.

Table 36.1
Historical Information in Dyspnea

<i>Occurrence</i>
Rest
Exertion (quantify)
Position
Orthopnea (dyspnea lying flat)
Trepopnea (dyspnea in lateral position)
Platypnea (dyspnea when upright)
Other precipitating factors
Environment
Emotional state
<i>Chronology</i>
Duration
Progression
Diurnal and seasonal variations
Constant or intermittent
<i>Relieving factors</i>
Rest
Medications (physician and self-prescribed)
<i>Predisposing factors</i>
Cigarette smoking
Occupational and environmental exposures
<i>Associated medical diseases and symptoms</i>
Pulmonary
Cardiac
Neuromuscular
<i>Family history</i>

Basic Science

Dyspnea is a difficult subject to study in the laboratory because it is detected and measured only by subjective reporting in conscious people. There are a number of ways to produce uncomfortable respiratory sensations in normal people. These include breathing through devices with increased resistance and chest wall restriction produced by elastic wrapping. In addition, everyone develops a very uncomfortable and irresistible urge to breathe following prolonged breath holding. A somewhat similar sensation may be produced by preventing sighing or occasional deep breathing in normal subjects. A rapid elevation in arterial carbon dioxide tension produces an uncomfortable respiratory sensation accompanied by a headache in normal subjects.

The sensations produced in normal people by the above experiments are probably not the same, even though they frequently are lumped into the single category of dyspnea. Similarly, it is probable that patients with complaints of dyspnea do not all have identical sensations. Dyspnea is a common complaint in patients with obstructive and restrictive pulmonary disorders. In addition, patients with chest wall abnormalities such as kyphoscoliosis and patients with neuromuscular disease frequently complain of dyspnea. What the mechanisms for these various dyspneic sensations are is not completely clear. Most diseases associated with dyspnea are accompanied by an abnormality in pulmonary mechanics with a subsequent increase in the overall work of breathing. The increased work of breathing may be due to an increase in elastic work (restrictive disease) or resistive work (obstructive disease). The conscious perception of dyspnea probably results from a complicated interrelationship of peripheral receptors, neural pathways, and the central nervous system. The peripheral receptors most commonly implicated include receptors in the chest wall associated with the respiratory muscle spindles, receptors in the pulmonary parenchyma, receptors in the central airways, and chemoreceptors such as the carotid body. The connecting neural pathways include the vagi and afferent neurons in the spinal cord. The central neural mechanisms include central chemoreceptors, inspiratory neurons in the medulla, and higher cortical centers. Whenever these mechanisms produce an overall respiratory pattern where an increased requirement for ventilation is balanced by an expected increase in respiratory output, no sensation of abnormal breathing occurs. When respiratory output is in some way inappropriate for ventilation requirements, the conscious sensation of this inappropriateness results in the sensation of dyspnea.

It is of some interest that dyspnea is generally not experienced by normal subjects subjected to progressive arterial hypoxemia. Subjects exposed to reduced oxygen tensions generally demonstrate progressive central nervous system dysfunction, but do not complain of difficulty breathing. Hypoxemia undoubtedly contributes to dyspnea in patients with preexisting pulmonary dysfunction by stimulating respiration and increasing ventilation, but probably does not directly produce the sensation of dyspnea.

Clinical Significance

A few of the most common disorders are outlined here. Patients with *chronic obstructive pulmonary disease* (COPD), which comprises emphysema and chronic bronchitis, gen-

erally present with a long history of cigarette smoking and gradually progressive dyspnea over a number of years. Pulmonary function abnormalities frequently progress for years before clinical dyspnea occurs. Most patients do not have day-to-day variation in their symptoms, but they may have exacerbations during the winter months. A productive cough is a frequent associated symptom, and the sputum may become purulent during exacerbations.

In *asthma*, periods of dyspnea frequently alternate with periods of normal breathing. There may be a family history of asthma, and clear-cut precipitating factors or events may be noted by the patient. Seasonal and diurnal variations in symptoms are common. The patient usually perceives wheezing. A productive cough is frequent, particularly during recovery from an acute attack. Many patients self-medicate with over-the-counter, metered-dose inhalers. Some patients have extrapulmonary symptoms suggesting generalized atopy.

Patients with *pulmonary fibrosis* generally present with progressive and relentless dyspnea with a variable time course. Frequently the only associated symptom is a non-productive cough. Extrapulmonary manifestations of diseases associated with pulmonary fibrosis may be present. The occupational and environmental history is particularly important.

Congestive heart failure, when acute, may be associated with myocardial infarction. Chronic congestive heart failure is associated with a number of myocardial diseases. Patients with congestive heart failure frequently present with progressive dyspnea, orthopnea, and peripheral edema. These disorders are described more fully in Section II, Cardiovascular System.

Patients with acute *pulmonary thromboembolism* present with a sudden onset of dyspnea. They frequently have associated pleuritic chest pain and may have hemoptysis. Disorders that predispose to deep venous thrombosis are frequently present as an underlying factor.

Patients with a *pneumothorax* generally have the sudden onset of dyspnea accompanied by unilateral chest pain. Characteristic physical findings and radiographic findings are present. Most patients with pneumothoraces are either healthy young adults or middle-aged and elderly patients with bullous pulmonary disease.

Dyspnea is a frequent symptom in patients with acute *pneumonia*, but is generally not the predominant complaint. Most patients have fever, chest pain, and a productive cough. Dyspnea may be the predominant complaint in some patients with diffuse pneumonia, especially when the pneumonia is nonbacterial in origin.

Dyspnea is seldom the predominant complaint in patients with primary *neuromuscular disease*, but it may be a significant complaint in some patients with generalized muscular weakness. The major problem is generally one of distinguishing between exertional fatigue and weakness and exertional dyspnea. Neuromuscular disorders are covered more completely in Section IV, Neurological System.

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